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PATHOLOGY OF CUTANEOUS SYSTEM

- Developmental anomalies
- Acanthosis nigricans
- Dermatitis
  - Vesicular dermatitis
  - Parasitic dermatitis
  - Allergic dermatitis
  - Gangrenous dermatitis
- Equine cutaneous granuloma
- Miscellaneous lesions of skin
- Model Questions
DEVELOPMENTAL ANOMALIES

Congenital ichthyosis
Congenital ichthyosis is scaly epidermis which resembles with skin of fish and occurs due to a simple autosomal recessive homozygous gene in calves. This condition is characterized by scaly, horny, thick epidermis divided into plates by deep fissures. Microscopically, there is thick keratin layer over the epidermis.

Epitheliogenesis imperfecta
Epitheliogenesis imperfecta is a congenital defect characterized by discontinuity of epithelium on skin leaving patches without squamous epithelium mostly at feet, claws and oral mucosa. Such defect may occur in calves which succumb to infection after birth or such foetus may abort. This disease condition is inherited as an autosomal recessive trait.

Congenital alopecia
Alopecia or hairlessness on the skin with complete lack of hair follicles has been observed in dog and other animals. Such hair less sites may follow a regular pattern or occurs in patches. This is a hereditary defect recognized in certain breeds.

Congenital albinism
Albinism is absence of melanin pigmentation due to deficiency of tyrosinase. This congenital abnormality is encountered sporadically due to a recessive trait in most species. The melanocytes are present but there is lack of melanin synthesis due to tyrosinase deficiency.

Congenital cutaneous asthenia
The collagen fibers are irregular in size and orientation and become fragmented due to disorganization of fibrils within the fibers. This condition occurs due to a deficiency in procollagen peptidase responsible for formation of collagen. This condition leads to hyperelasticity and fragility of skin and hypermotility of joints in cattle, sheep and dogs.

ACANTHOSIS NIGRICANS
This is increased amount of melanin in skin along with hyperkeratosis. This condition commonly occurs in dogs, at ventral abdomen and medial surface of legs.

Etiology
- Hormonal imbalance
- Tumors of testicles and pituitary gland

Macroscopic features
- Colour of skin becomes black
- Dry and scaly skin due to hyperkeratosis

Microscopic features
- Proliferation of melanocytes and melanoblasts.
- Black/brown colour pigment intracellular/ extracellular.
- Cells appear as black or brown globular mass.
- Melanin granules are minute, dirty brown in colour and spherical in shape.
- Hyperkeratinization.

DERMATITIS
Dermatitis is the inflammation of skin characterized by hyperemia, erythema, serus exudation and infiltration of neutrophils and mononuclear cells (Fig. 12.1 to 12.4).

Etiology
- Bacteria, Viruses, Chemicals, Allergy, Trauma, Fungi and their toxins.

Macroscopic features
- Erythematous patches on skin
- Swelling of skin, itching sensation leads to damage/scratch due to rubbing.
- Loss of hairs, patches on skin, alopecia.

Microscopic features
- Hyperemia
- Serus exudate
- Infiltration of neutrophils and mononuclear cells.
- Presence of fungus in skin scrapings.
Fig 12.1. Photograph of a camel showing skin patches of fungal dermatitis

Fig 12.2. Photomicrograph of skin scraping showing presence of fungus (Trichophyton metagraphte).

Fig 12.3. Photomicrograph of skin scraping showing presence of fungus (Trichophyton verricosum).

Fig 12.4. Photograph of a calf showing ringworm on face

Fig 12.5. Photograph showing vesicle on teat.

Fig 12.6. Photograph showing vesicles on skin (ARS/USDA)

Fig 12.7. Photomicrograph showing hydropic degeneration and vesicle formation (v) (ARS/USDA)

Fig 12.8. Diagram of vesicle in skin
VESICULAR DERMATITIS
Vesicular dermatitis is excessive accumulation of clear fluid in dermis and epidermis leading to vesicle/blisters formation. It is also known as hydropic dermatitis (Fig. 12.5 to 12.8).

Etiology
- Sunburn
- Heat
- Foot and Mouth Disease virus
- Pox virus

Macroscopic features
- Oedematous fluid in dermis and epidermis resulting in thickening of skin
- Hyperemia, vesicles.
- Break of vesicles leads to clear fluid discharge.

Microscopic features
- Hyperemia
- Accumulation of clear fluid in epidermis and dermis, which is characterized by clear spaces or takes light pink stain of eosin.
- Some cells show hydropic degeneration.
- Infiltration of leucocytes.

PARASITIC DERMATITIS (ACARIASIS)
Acariasis or mange is caused by mites and characterized by hyperkeratosis and inflammation of skin leading to itching, rubbing and scratching (Fig. 12.9 to 12.18).

Etiology
- Mites
  - *Sarcoptes scabiei*
  - *Psoroptic* sp.
  - *Demodectic* sp.
  - *Chorioptic* sp.

Macroscopic features
- Hyperkeratosis of skin, dry and scaly appearance of skin.
- Hemorrhage/trauma due to rubbing/scratching as a result of intense itching.
- Absence of hairs on lesions.

Microscopic features
- Hyperkeratinization of skin.
- Hyperemia
- Infiltration of neutrophils, lymphocytes, macrophages, eosinophils
- Presence of mites at the site of lesions

ALLERGIC DERMATITIS
This is the inflammation of skin sensitized to certain substances, known as allergens. Such inflammation can be seen as a result of delayed type hypersensitivity (DTH) reaction.

Etiology
- Chemicals (DNCB/DNFB) (Fig. 12.19 & 12.20).
- Tuberculin reaction (Fig. 12.21 & 12.22).
- Allergic reaction
- Soaps, detergents, organic chemicals
- Parasites- fleas

Macroscopic features
- Hyperemia, Erythema
- Oedematous/nodular swelling, hard to touch.
- Hot, painful
- Atopy with vesicular rash, pruritus, serous exudate.

Microscopic features
- Infiltration of eosinophils and mononuclear cells, macrophages, lymphocytes.
- Hyperemia, oedema, necrosis

GANGRENOUS DERMATITIS
Gangrenous dermatitis is the inflammation of skin along with formation of gangrene caused by fungal toxins and characterized by sloughing of skin, dry gangrene with break in epidermis.

Etiology
- *Fusarium* sp. toxins
- Rice straw feeding- Degnala disease

Macroscopic features
- Presence of gangrenous inflammation on extremities such as legs, udder, ears, tail, scrotum (Fig. 12.23 to 12.25).
Fig 12.9. Photomicrograph of Sarcoptes scabei

Fig 12.10. Photograph showing mange due to S. scabei in a camel.

Fig 12.11. Photograph of camel showing orchitis due to mange.

Fig 12.12. Photograph of a dog showing pustular dermatitis due to demodectic mange.

Fig 12.13. Photograph of dog showing demodectic mange.

Fig 12.14. Photograph showing pustular dermatitis due to demodectic mange (ARS/USDA).

Fig 12.15. Photograph of cow showing demodectic mange (ARS/USDA).

Fig 12.16. Photomicrograph showing demodectic mites in cyst (ARS/USDA).
Fig 12.17. Photograph of horse showing chorioptic mange

Fig 12.18. Photograph of horse showing chorioptic mange

Fig 12.19. Photograph of sheep showing DTH reaction

Fig 12.20. Photomicrograph showing DTH reaction in skin

Fig 12.21. Photograph of tuberculoid dermatitis (ARS/USDA)

Fig 12.22. Photomicrograph of tuberculoid dermatitis (ARS/USDA)

Fig 12.23. Photograph showing dry gangrene on scrotum of a buffalo bull due to fusariotoxicosis

Fig 12.24. Photograph showing sloughing of hoofs in buffaloes due to fusariotoxicosis
Fig. 12.25. Photograph showing sloughing of skin from udder due to Fusariotoxicosis.

Fig. 12.26. Photograph showing papule on beak and around eyes.

Fig. 12.27. Photograph showing presence of scab and scar on skin of camel.

Fig. 12.28. Photomicrograph of skin showing Acanthosis

Fig. 12.29. Photomicrograph of skin showing erosion

Fig. 12.30. Diagram of abscess

Fig. 12.31. Photomicrograph of ulcer

Fig. 12.32. Diagram of ulcer
- Sloughing of skin leaving raw surface.
- Sloughing of hoofs with haemorrhage

**Microscopic features**
- Inflammation of skin and invasion by saprophytes causing dissolution of cells/tissue
- Infiltration of mononuclear cells at the periphery of the lesion.

**EQUINE CUTANEOUS GRANULOMA**
There is development of chronic, ulcerated and bloody granuloma on limb of horses due to wire cuts or other cutaneous injury.

**Etiology**
- Skin cuts/injury
- Habronemiasis
- Phycomycosis
  - *Hyphomyces destruens*
  - *Entomorphthora coronata*

**Macroscopic features**
- Granulation tissue in wound.
- Presence of yellowish/white specks.
- Summer sores/Bursatti.

**Microscopic features**
- Tissue composed of newly formed fibrous tissue, with large number of capillaries, infiltration of eosinophils
- Presence of necrotic masses stains deep red with H&E
- Presence of helminths in section- cutaneous habronemiasis
- Presence of septic hyphae of fungus

**MISCELLANEOUS LESIONS OF SKIN**

**Papule:** Focal Hyperplasia of stratum spinosum epithelium leading to hard nodular eruption on skin (Fig. 12.26).

**Vesicle:** A cavity in epidermis containing fluid and covered by a thin layer of epidermis elevated from the surface (Fig. 12.6 & 12.7).

**Pustule:** A vesicle filled with pus (Fig. 12.14).

**Acanthosis:** Thickening of epidermis due to hyperplasia of stratum spinosum/prickle cell layer (Fig. 12.28).

**Hyperkeratosis:** Thickening of keratin layer stratum corneum.

**Parakeratosis:** The retention of nucleus in keratin layer.

**Bulla/bleb:** Cavitations in epidermis filled with fluid and larger than vesicle.

**Erosion/Excioriation:** Superficial loss of epithelium (Fig. 12.29).

**Fissure:** Linear defect in epidermis, which may be crusted at mucocutaneous junctions.

**Abscess:** A circumscribed cavity filled with pus (Fig. 12.30).

**Ulcera:** A break in the continuity of the epidermis exposing dermis (Fig. 12.31).

**Urticaria:** A circumscribed area of swelling/oedema involving dermis

**Folliculitis:** Inflammation of hair follicles.

**Acne:** Enlargement of sealed off hair follicles or sebaceous glands and rupture through the epidermis. It leaves a rounded hole in the epidermis and a canal down to the dermis.

**Eczema:** Eczema is a form of allergic dermatitis of obscure etiology and characterized by erythema, vesicular rash, serus exudate and pruritus.
MODEL QUESTIONS

Q. 1. Fill in the blanks with appropriate word(s).
1. …………. is a cavity in epidermis containing fluid and covered by a thin layer of ……. elevated from the surface. If it is filled with pus, then known as ………….
2. Superficial loss of epithelium in skin is known as ………….. or ………… while the discontinuity of epidermis is termed as ………….
3. In congenital ichthyosis, the skin looks like ………….. as of fish.
4. Congenital discontinuity of epithelium of skin leaving patches without squamous epithelium is known as ………….
5. Acanthosis nigricans is increased amount of ………….. caused by ………….. or tumors of …………..and …………..

Q. 2. Write true or false against each statement and correct the false statement.
1. ………..Urticaria is a circumscribed area of swelling in dermis
2. ………..Ulcer is filled with fluid in epidermis
3. ………..Parakeratosis is thickening of keratin layer.
4. ………..Bulla is a large cavity in epidermis filled with fluid.
5. ………..Albinism is absence of melanin in skin.
6. ………..Cutaneous asthenia occurs due to deficiency of procollagen peptidase.
7. ………..Proliferation of melanocytes occurs in Acanthosis nigricans.
8. ………..Sun light may cause dermatitis.
9. ………..Mange is caused by mites in animals.
10. ………..Phycomycosis may lead to cutaneous granuloma in horses.

Q. 3. Define the followings.
1. Scaly skin
2. Alopecia
3. Dermatitis
4. Papule
5. Pustule
6. Bleb
7. Parakeratosis
8. Erosion
9. Abscess
10. Urticaria

Q. 4. Write short notes on.
1. Epitheliogenesis imperfecta
2. Acanthosis nigricans
3. Allergic dermatitis
4. Equine cutaneous granuloma
5. Eczema

Q. 5. Select an appropriate word(s) from the four options given with each question.
1. In congenital ichthyosis, the skin of calves resembles with the skin of …………..
   (a) Toad  (b) Fish  (c) Tortoise  (d) Zebra
2. Acanthosis is ………….. of skin epithelium.
   (a) Hypoplasia  (b) Aplasia  (c) Hyperplasia  (d) Anaplasia
3. Vesicle formation occurs in skin as a result of …………..
   (a) Cloudy swelling  (b) Hydropic degeneration  (c) glycogen storage  (d) Fatty change
4. Acariasis is caused by ……..
   (a) Bacteria  (b) Virus  (c) Chlamydia  (d) Mite
5. Enlargement of seald off hair follicle or sebaceous gland is known as ……
   (a) Acne  (b) Folliculitis  (c) Fissure  (d) Bleb
6. A break in the continuity of the epidermis exposing dermis is known as ……
   (a) Erosion  (b) Ulcer  (c) Fissure  (d) Vesicle
7. Hyperkeratosis is the thickening of …………….
   (a) Prickle cell layer  (b) Stratum lucidum  (c) Stratum corneum  (d) Dermis
8. Superficial loss of epithelium on skin or mucous membrane is known as ……
   (a) Erosion  (b) Abrasion  (c) Ulcer  (d) Fissure
9. Papule is hyperplasia of ………. Epithelium.
   (a) Stratum corneum  (b) Stratum lucidum  (c) Stratum spinosum  (d) Dermis
10. Retention of nucleus in keratin layer of skin is known as ………
    (a) Hyperkeratosis  (b) Parakeratosis  (c) Urticaria  (d) Acanthosis